CLAIMS

What is claimed is:

1. A bound microparticle comprising an absorbable heterochain polymer core and one or more peptide, one or more protein or a combination thereof immobilized on said absorbable heterochain polymer core,

wherein each peptide is independently selected from the group consisting of growth hormone releasing peptide (GHRP), luteinizing hormone-releasing hormone (LHRH), somatostatin, bombesin, gastrin releasing peptide (GRP), calcitonin, bradykinin, galanin, melanocyte stimulating hormone (MSH), growth hormone releasing factor (GRF), amylin, tachykinins, secretin, parathyroid hormone (PTH), enkaphelin, endothelin, calcitonin gene releasing peptide (CGRP), neuromedins, parathyroid hormone related protein (PTHrP), glucagon, neurotensin, adrenocorticothrophic hormone (ACTH), peptide YY (PYY), glucagon releasing peptide (GLP), vasoactive intestinal peptide (VIP), pituitary adenylate cyclase activating peptide (PACAP), motilin, substance P, neuropeptide Y (NPY), TSH and analogs and fragments thereof or a pharmaceutically acceptable salt thereof; and

wherein each protein is independently selected from the group consisting of growth hormone, erythropoietin, granulocyte-colony stimulating factor, granulocyte-macrophage-colony stimulating factor and interferons.

2. A bound microparticle according to claim 1 wherein said peptide, protein or a combination thereof or a pharmaceutically acceptable salt thereof comprises 0.1% to 30% of the total mass of the bound microparticle.

3. A bound microparticle according to claim 2 wherein said absorbable heterochain polymer core comprises glycolate units.

4. A bound microparticle according to claim 3 wherein the absorbable heterochain polymer core further comprises citrate residues.

5. A bound microparticle according to claim 4 wherein the ratio of glycolate units to citrate residues is about 7-1 to about 20-1.

6. A bound microparticle according to claim 3 wherein the absorbable polymer core further comprises tartrate residues.

7. A bound microparticle according to claim 6 wherein the ratio of glycolate units to tartrate residues is about 7-1 to about 20-1.

8. A bound microparticle according to claim 3 wherein the absorbable heterochain polymer core further comprises malate residues.

9. A bound microparticle according to claim 8 wherein the ratio of glycolate units to malate residues is about 7-1 to about 20-1.

10. A bound microparticle according to claim 3 wherein said glycolate units terminate with a carboxyl moiety.

11. A bound microparticle according to claim 3 wherein said glycolate units terminate with an amine moiety.

12. An encased microparticle comprising one or more of a bound microparticle encased within an absorbable encasing polymer,

wherein said bound microparticle comprises an absorbable heterochain polymer core and one or more peptide, one or more protein or a combination thereof immobilized on said absorbable heterochain polymer core,

where each peptide is independently selected from the group consisting of growth hormone releasing peptide (GHRP), luteinizing hormone-releasing hormone (LHRH), somatostatin, bombesin, gastrin releasing peptide (GRP), calcitonin, bradykinin, galanin, melanocyte stimulating hormone (MSH), growth hormone releasing factor (GRF), amylin, tachykinins, secretin, parathyroid hormone (PTH), enkaphelin, endothelin, calcitonin gene releasing peptide (CGRP), neuromedins, parathyroid hormone related protein

(PTHrP), glucagon, neurotensin, adrenocorticothrophic hormone (ACTH), peptide YY (PYY), glucagon releasing peptide (GLP), vasoactive intestinal peptide (VIP), pituitary adenylate cyclase activating peptide (PACAP), motilin, substance P, neuropeptide Y (NPY), TSH and analogs and fragments thereof or a pharmaceutically acceptable salt thereof;

where each protein is independently selected from the group consisting of growth hormone, erythropoietin, granulocyte-colony stimulating factor, granulocyte-macrophage-colony stimulating factor and interferons; and where said absorbable heterochain polymer core comprises glycolate units.

13. An encased microparticle according to claim 12 wherein said peptide, protein or combination thereof or pharmaceutically acceptable salt thereof comprises 0.1% to 30% of the total mass of the bound microparticle, and where said absorbable heterochain polymer core further comprises citrate residues, tartrate residues or malate residues.

14. An encased microparticle according to claim 13 wherein the ratio of glycolate units to citrate residues, tartrate residues or malate residues is about 7-1 to about 20-1 and said glycolate units terminate with a carboxyl moiety or an amine moiety.

15. An encased microparticle according to claim 14 wherein said absorbable encasing polymer comprises

(a) l-lactide based units and glycolide based units,

(b) d,l-lactide based units and glycolide based units,

(c) d,l-lactide based units or

(d) l-lactide based units and d,l-lactide based units.

16. An encased microparticle according to claim 15 wherein the ratio of l-lactide based units to glycolide based units is about 75-25 to about 90-10.

17. An encased microparticle according to claim 15 wherein the ratio of l-lactide based units to d,l-lactide based units is about 80-20.

18. An encased microparticle according to claim 15 wherein the ratio of d,l-lactide based units to glycolide based units is about 75-25 to about 90-10.

19. An encased microparticle according to claim 14 wherein the absorbable encasing polymer constitutes 5 to 70% of the total mass of the encased microparticle.

20. An encased microparticle according to claim 19 wherein the absorbable encasing polymer constitutes 20-60% of the total mass of the encased microparticle.

21. An encased microparticle according to claim 20 wherein the absorbable encasing polymer constitutes 30-50% of the total mass of the encased microparticle.

22. A pharmaceutical composition comprising the bound microparticles according to claim 1 and a pharmaceutically acceptable carrier.

23. A pharmaceutical composition comprising the bound microparticles according to claim 1, a non-aqueous absorbable gel-forming liquid polyester and optionally a pharmaceutically acceptable carrier.

24. A pharmaceutical composition comprising the encased microparticles according to claim 12 and a pharmaceutically acceptable carrier.

25. A pharmaceutical composition comprising the encased microparticles according to claim 12, a non-aqueous absorbable gel-forming liquid polyester and optionally a pharmaceutically acceptable carrier.

26. A bound microparticle according to claim 4 wherein the peptide is an LHRH analog.

27. A bound microparticle according to claim 26 wherein the ratio of glycolate units to citrate residues of the absorbable heterochain polymer core is about 7-1 to about 20-1 and where the LHRH analog is p-Glu-His-Trp-Ser-Tyr-D-Trp-Leu-Arg-Pro-Gly-NH_2.

28. A bound microparticle according to claim 6 wherein the peptide is an LHRH analog.

29. A bound microparticle according to claim 28 wherein the ratio of glycolate units to tartrate residues

is about 7-1 to about 20-1 and the LHRH analog is p-Glu-His-Trp-Ser-Tyr-D-Trp-Leu-Arg-Pro-Gly-NH_2.

30. A bound microparticle according to claim 4 wherein the peptide is a somatostatin analog.

31. A bound microparticle according to claim 30 wherein the ratio of glycolate units to citrate residues is about 7-1 to about 20-1 and the somatostatin analog is H-β-D-Nal-Cys-Tyr-D-Trp-Lys-Val-Cys-Thr-NH_2 where the two Cys residues are bonded by a disulfide bond, N-hydroxyethylpiperazinyl-acetyl-D-Phe-Cys-Tyr-D-Trp-Lys-Abu-Cys-Thr-NH_2 where the two Cys residues are bonded by a disulfide bond or N-hydroxyethylpiperazinyl-ethylsulfonyl-Phe-Cys-Tyr-D-Trp-Lys-Abu-Cys-Thr-NH_2 where the two Cys residues are bonded by a disulfide bond.

32. A bound microparticle according to claim 6 wherein the peptide is a somatostatin analog.

33. A bound microparticle according to claim 32 wherein the ratio of glycolate units to tartrate residues is about 7-1 to about 20-1 and the somatostatin analog is H-β-D-Nal-Cys-Tyr-D-Trp-Lys-Val-Cys-Thr-NH_2, where the two Cys residues are bonded by a disulfide bond, N-hydroxyethylpiperazinyl-acetyl-D-Phe-Cys-Tyr-D-Trp-Lys-Abu-Cys-Thr-NH_2 where the two Cys residues are bonded by a disulfide bond or N-hydroxyethylpiperazinyl-ethylsulfonyl-Phe-Cys-Tyr-D-Trp-Lys-Abu-Cys-Thr-NH_2 where the two Cys residues are bonded by a disulfide bond.

34. An encased microparticle comprising one or more bound microparticles according to claim 26 encased within an absorbable encasing polymer which comprises (a) l-lactide based units and glycolide based units,
(b) d,l-lactide based units and glycolide based units,
(c) d,l-lactide based units or
(d) l-lactide based units and d,l-lactide based units.

35. An encased microparticle according to claim 34 wherein the ratio of glycolate units to citrate residues of the absorbable polymer core is about 7-1 to about 20-1, the

LHRH analog is p-Glu-His-Trp-Ser-Tyr-D-Trp-Leu-Arg-Pro-Gly-NH_2 and where the ratio of:

(a) l-lactide based units to glycolide based units is about 75-25 to about 90-10,

(b) d,l-lactide based units to glycolide based units is about 75-25 to about 90-10 and

(c) l-lactide based units to d,l-lactide based units is about 80-20.

36. An encased microparticle comprising one or more bound microparticles according to claim 28 encased within an absorbable encasing polymer which comprises (a) l-lactide based units and glycolide based units,

(b) d,l-lactide based units and glycolide based units,

(c) d,l-lactide based units or

(d) l-lactide based units and d,l-lactide based units.

37. An encased microparticle according to claim 36 wherein the ratio of glycolate units to tartrate residues of the absorbable polymer core is about 7-1 to about 20-1, the LHRH analog is p-Glu-His-Trp-Ser-Tyr-D-Trp-Leu-Arg-Pro-Gly-NH_2 and where the ratio of:

(a) l-lactide based units to glycolide based units is about 75-25 to about 90-10,

(b) d,l-lactide based units to glycolide based units is about 75-25 to about 90-10 and

(c) l-lactide based units to d,l-lactide based units is about 80-20.

38. An encased microparticle comprising one or more bound microparticles according to claim 30 encased within an absorbable encasing polymer which comprises

(a) l-lactide based units and glycolide based units,

(b) d,l-lactide based units and glycolide based units,

(c) d,l-lactide based units or

(d) l-lactide based units and d,l-lactide based units.

39. An encased microparticle according to claim 38 wherein the ratio of glycolate units to citrate residues of the absorbable polymer core is about 7-1 to about 20-1, the somatostatin analog is H-β-D-Nal-Cys-Tyr-D-Trp-Lys-Val-

Cys-Thr-NH_2 where the two Cys residues are bonded by a disulfide bond, N-hydroxyethylpiperazinyl-acetyl-D-Phe-Cys-Tyr-D-Trp-Lys-Abu-Cys-Thr-NH_2 where the two Cys residues are bonded by a disulfide bond or N-hydroxyethylpiperazinyl-ethylsulfonyl-Phe-Cys-Tyr-D-Trp-Lys-Abu-Cys-Thr-NH_2 where the two Cys residues are bonded by a disulfide bond; and where the ratio of:

(a) l-lactide based units to glycolide based units is about 75-25 to about 90-10,

(b) d,l-lactide based units to glycolide based units is about 75-25 to about 90-10 and

(c) l-lactide based units to d,l-lactide based units is about 80-20.

40. An encased microparticle comprising one or more bound microparticles according to claim 32 and an absorbable encasing polymer which comprises

(a) l-lactide based units and glycolide based units,

(b) d,l-lactide based units and glycolide based units,

(c) d,l-lactide based units or

(d) l-lactide based units and d,l-lactide based units.

41. An encased microparticle according to claim 40 wherein the ratio of glycolate units to tartrate residues of the absorbable polymer core is about 7-1 to about 20-1, the somatostatin analog is H-β-D-Nal-Cys-Tyr-D-Trp-Lys-Val-Cys-Thr-NH_2 where the two Cys residues are bonded by a disulfide bond, N-hydroxyethylpiperazinyl-acetyl-D-Phe-Cys-Tyr-D-Trp-Lys-Abu-Cys-Thr-NH_2 where the two Cys residues are bonded by a disulfide bond or N-hydroxyethylpiperazinyl-ethylsulfonyl-Phe-Cys-Tyr-D-Trp-Lys-Abu-Cys-Thr-NH_2 where the two Cys residues are bonded by a disulfide bond; and where the ratio of:

(a) l-lactide based units to glycolide based units is about 75-25 to about 90-10,

(b) d,l-lactide based units to glycolide based units is about 75-25 to about 90-10 and

(c) l-lactide based units to d,l-lactide based units is about 80-20.

42. A process for making an encased microparticle according to claim 12 comprising the step of encasing a bound microparticle with an absorbable encasing polymer.

43. A process according to claim 42 wherein a dispersion of said bound microparticles in a solution comprising said absorbable encasing polymer and a solvent is dropped onto a pre-cooled medium, where said medium is not a solvent of said absorbable encasing polymer.

44. A process according to claim 43 wherein the solution of the absorbable encasing polymer consists of about 5% to 30% of the absorbable encasing polymer, the pre-cooled medium is an alcohol having two or more carbon atoms and the temperature of the medium is room temperature to about -80°C.

45. A process according to claim 44 wherein the temperature of the pre-cooled medium is about -60°C to -80°C and the medium is isopropyl alcohol.

46. A process for making an encased microparticle according to claim 12 comprising the step of encasing a bound microparticle with an absorbable encasing polymer using an emulsion technique.